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science for a changing world

Land Change Monitoring Assessment and Projection: LCMAP

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USGS EROS Motivations

- Modernize access to the Landsat archive
- Transform the USGS land cover legacy – from mapping to monitoring
- Meet USGS land change science needs:
  - Landsat and the land change mission
  - Geographic research on understanding the connections between human activity and natural systems
  - Climate and land use
- Integrate EROS science and applications into a focused, integrated vision

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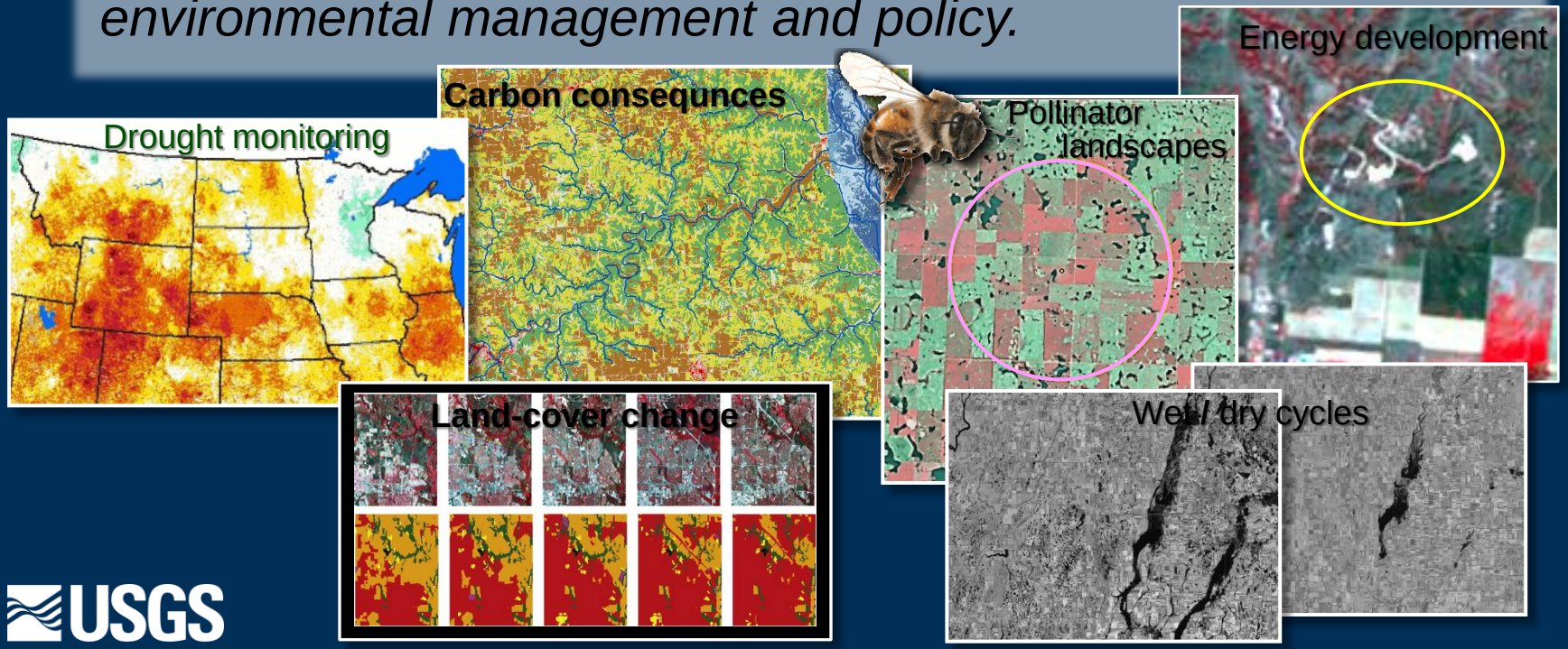
Land Change Monitoring, Assessment, and Projection (LCMAP)

A capability to continuously track and characterize changes in land cover, use, and condition and translate this information into assessments of current and historical processes of change in order to provide a science foundation for evaluations and decisions relevant to environmental management and policy.



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Broad LCMAP Objectives

- Explain where, how, and why the landscape is changing. Provide documentation and understanding of historical and contemporary land change *as it occurs,* and scenario-based projections of future change.
- Explain how past, present, and future land change affects people and natural systems. Topical emphases include land-change impacts on weather and climate, the carbon cycle, water resources, and ecosystem functioning.
- Alert relevant stakeholders to important or emerging land-change events in their jurisdictions.

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LCMAP Conceptual Framework and Flow

Stakeholder interests and info needs

External data

External research

Communications, applications services, outreach, and other users and stakeholder support

- Communications & outreach
- Web-based access to all products
- Web-based analysis portal
- Applications support

R&D

Analysis-ready Data

Single Scene Processes

Level 1 | Surf. refl. / Surf. temp.

Re-project to output space

Single Scene Products

On-line Storage

Single Scene Products | Multi-scene Products

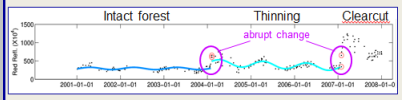
Multi-scene Processes

- Compositing
- Masking
- Stacking
- Other

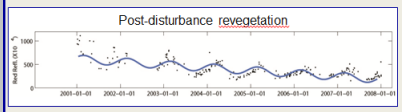
Continuous Monitoring

Collection of algorithms to identify types of abrupt and gradual change on a per-pixel basis

Abrupt Change



Gradual Change



Abrupt Change

Document Historical

- Maps of thematic land cover/change
- Maps of footprints of change
- Maps of timing of change
- etc.

Detect land change as it occurs

- Maps of current land cover and recent change
- Recent footprints of change

Gradual Change

Characterize land-cover condition; identify trends; cyclical phase shifts; other gradual change.

- Maps of types, rates, locations, timing, and duration of gradual-change
- Maps of phenological characteristics

Spatial analyses of change

Assessments

Syntheses of the geography of land change, land-change processes, characteristics, and consequences relevant to USGS stakeholders. Both scheduled standard and *ad hoc* topics should be conducted.

- Annual land-change assessments (*'State of the Nation'* reports)
- Topical assessments (current events, emerging issues, other high-interest topics)
- Stakeholder alerts

Projections

Projected patterns of future land use, land cover, and/or land conditions that address potential interactions between current environmental characteristics and drivers of change (e.g., climate, socioeconomic, legislative).

- Maps of trajectories of projected land change
- Maps of likelihood of change
- Maps of directions/intensities of change

External data

Federal partners

Information Warehouse and Data Store

- Metadata
- Land cover change/condition products
- Outputs from assessments
- Non-Landsat remote sensor data
  - Satellite data
  - Airborne
- Non-Landsat rem. sens. prods.
  - DEMs & derivatives
  - Orthoimagery
  - Evapotranspiration
  - Vegetation phenology
  - Others
- Ground-based data
  - Cal/Val data
  - Land cover accuracy/valid.
  - Others

External data

Toward a federal monitoring system

- Major partners:
  - LCMS
  - MRLC
  - LCMAP
- Work sharing as appropriate:
  - Access to science quality Landsat data
  - Standards, protocols
  - Reference data and sampling design
  - TBD

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Why CCDC?

- Developed through a USGS/LST-funded research project.
- Clear emphasis on all land cover types and transitions.
- Uses all available data.
- Conceptually aligned with USGS and EROS land change monitoring and assessment goals.

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